

Climate change and its impact on arctic ice and the arctic food web has been a topic of social media controversy for a number of years. In a National Geographic article entitled, “Polar Bears Really Are Starving Because of Global Warming”, scientists tracked nine different polar bears over an eight to eleven day period in order to analyze the hunting behavior and metabolic rates of polar bears living in the Beaufort Sea territory. The data obtained from this study revealed the high metabolic requirements of polar bear as well as hunting/feeding success and failure in an environment impacted by the loss of arctic sea ice. Below is an analysis of how this article meets tenets set forth in both the Nature of Science and the Common Core Mathematics Practices.

The Nature of Science is represented in a variety of ways throughout this paper. Below is an analysis of three tenets within the Nature of Science and evidence from the article to support each tenet. Next Generation Science Standards. *Appendix H - Understanding the Scientific Enterprise*. Retrieved from

<https://www.nextgenscience.org/sites/default/files/Appendix%20H%20-%20The%20Nature%20of%20Science%20in%20the%20Next%20Generation%20Science%20Standards%204.15.13.pdf>

1. **Scientific Investigations Use a Variety of Methods:** Science investigations use a variety of methods and tools to make measurements and observations.

This article highlights the scientific methods and tools used to collect data and make measurements including GPS collars, blood and urine samples. As stated in the article, “Pagano’s study involved capturing nine female bears in the Beaufort Sea off Alaska last April, when there are normally lots of seals around. The bears were fitted with GPS collars that had cameras to record point-of-view videos of each. Blood and urine samples were also taken. Eight to 11 days later they were all re-captured. One bear had moved 155 miles away by that time. Blood and urine samples were taken again and the video and other data were downloaded.” Leahy, S. (2018, February 1) *Polar Bears Really Are Starving Because of Global Warming, Study Shows*. National Geographic. Retrieved from

<https://news.nationalgeographic.com/2018/02/polar-bears-starve-melting-sea-ice-global-warming-study-beaufort-sea-environment/>

2. **Scientific Knowledge is Based on Empirical Evidence:** Science knowledge is based upon logical and conceptual connections between evidence and explanations.

Arctic sea ice retreat and glacial melting has been documented over the years and it has been long suggested that Polar Bear are starving due to the loss of ice, however,

population data has fluctuated. This study has helped to reveal data on polar bear metabolic activity as well as the struggle in successful hunting in an arctic region experiencing ice loss. As stated in the article, “The videos revealed that four of the females weren’t able to catch a single seal. Measurements showed those animals lost 10 percent or more of their body mass. One bear lost close to 44 pounds, including her lean muscle, in 10 days. This bear even leapt into the sea in a failed attempt to catch a seal swimming by.” Leahy, S. (2018, February 1) *Polar Bears Really Are Starving Because of Global Warming, Study Shows*. National Geographic. Retrieved from <https://news.nationalgeographic.com/2018/02/polar-bears-starve-melting-sea-ice-global-warming-study-beaufort-sea-environment/>

3. **Scientific Knowledge is Open to Revision In Light of New Evidence:** Scientific explanations are subject to revision and improvement in light of new evidence. Science findings are frequently revised and/or reinterpreted based on new evidence.

This study helped to reveal the true metabolic activity of the polar bear, as this newly collected data revealed that the bears burn 60 percent more calories per day than scientists had estimated. As stated in the article, “The data showed the bears were active about 35 percent of the time and resting for the remainder, yet they burned through 12,325 calories a day, much of it from their body reserves. That’s about 60 percent more than previous studies had estimated.” Leahy, S. (2018, February 1) *Polar Bears Really Are Starving Because of Global Warming, Study Shows*. National Geographic. Retrieved from <https://news.nationalgeographic.com/2018/02/polar-bears-starve-melting-sea-ice-global-warming-study-beaufort-sea-environment/> This evidence helps to reflect the Nature of Science and show how science is ever changing and evolving in light of new data.

Common Core Mathematics Practices should equally be reflected in a well written, scientific article. Below is evidence of how the article helps to utilize mathematics in order to support the claim presented in the article. Common Core State Standards Initiative. *Standards for Mathematical Practice*. Retrieved from <http://www.corestandards.org/Math/Practice/>

1. **CCSS.MATH.PRACTICE.MP5 Use appropriate tools strategically.**

It is critical that the data presented and analyzed was collected using appropriate tools to validate the study and obtain accurate evidence to support the claim.. In this study, it was necessary to be able to track where polar bears traveled to, and record footage of their prey captures in order to determine the distance of travel experienced by polar bears in order to find a viable food source. This study used tools strategically due to the fact that, “The bears were fitted with GPS collars that had cameras to record point-of-view videos of each.” Leahy, S. (2018, February 1) *Polar Bears Really Are Starving Because of Global Warming, Study Shows*. National Geographic. Retrieved from

<https://news.nationalgeographic.com/2018/02/polar-bears-starve-melting-sea-ice-global-warming-study-beaufort-sea-environment/>

2. **CCSS.MATH.PRACTICE.MP3 Construct viable arguments and critique the reasoning of others.**

Strong and valid arguments are supported by evidence. As stated in Standards for Mathematical Practice on page 2, “Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. “

Social media has used polar bears as the icon of climate change and global warming. In 2007, National Geographic released a video showing a starving polar bear, but was arctic sea ice to blame? (video: https://www.youtube.com/watch?v=_JhaVNJb3ag) Conflicting reports circulate throughout social media on polar bear populations and stability of these animals.

This article presents data that helps to uncover the true metabolic and hunting activity of these animals. The article presents some strong mathematical data as the study reveals that polar bears burn 60 percent more calories per day than scientists have estimated. Additionally, this study supports that polar bears struggle to find food within range as four out of nine studied bear did not have a successful kill within the eight to eleven day study period. As further stated and supported in the article, “As the sea ice melts earlier and earlier, polar bears are forced to swim more and more, to reach seal populations,” said author Blaine Griffen, a biologist at BYU in a release. One female bear Griffen studied swam 426 miles over nine days. She lost 22 percent of her body weight and, worse, lost the nursing cub that had started the journey with her.” Leahy, S. (2018, February 1) *Polar Bears Really Are Starving Because of Global Warming, Study Shows*. National Geographic. Retrieved from <https://news.nationalgeographic.com/2018/02/polar-bears-starve-melting-sea-ice-global-warming-study-beaufort-sea-environment/> The data presented in this article help one to construct a viable argument that polar bear decline is interconnected with melting arctic sea ice.

3. **CCSS.MATH.PRACTICE.MP4 Model with mathematics.**

When discussing an issue as large as climate change, it is essential to be able to model with mathematics in order to show loss of arctic sea ice loss over a number of years as well as polar bear population future predictions. As stated in Standards for Mathematical Practice when discussing student qualities that successfully model with mathematics on page 2 , “They are able to identify important quantities in a practical situation and map

their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions.”

Throughout this article, one can identify many points when the author helps to model with mathematics. With regard to arctic sea ice, the author sites satellite data by stating, “[Climate change](#) is heating up the Arctic faster than anywhere else, and sea ice is shrinking 14 percent per decade. Even today, in the middle of the bitter cold Arctic winter, satellites show there is about [770,000 square miles](#) less sea ice than the 1981 to 2010 median (That's an area larger than Alaska and California combined). Leahy, S. (2018, February 1) *Polar Bears Really Are Starving Because of Global Warming, Study Shows*. National Geographic. Retrieved from <https://news.nationalgeographic.com/2018/02/polar-bears-starve-melting-sea-ice-global-warming-study-beaufort-sea-environment/>

When discussing the trend in polar bear populations, mathematical models have been used to track polar bear populations across the arctic. As stated, Best estimates say there are 20,000 to 30,000 polar bears in 19 different groups or populations scattered across the top of the U.S., Canada, Greenland, Norway, and Russia. Four of these populations are considered to be declining. Bears in the Beaufort Sea region are among the best studied and their numbers have fallen 40 percent in the last ten years.” Leahy, S. (2018, February 1) *Polar Bears Really Are Starving Because of Global Warming, Study Shows*. National Geographic. Retrieved from <https://news.nationalgeographic.com/2018/02/polar-bears-starve-melting-sea-ice-global-warming-study-beaufort-sea-environment/>

National Geographic Article, “*Polar Bears Are Starving Because of Global Warming, Study Shows*”:

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